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ABSTRACT

This report examines the teacher supply/demand balance nationally and in the western region of the United States and relates the findings to the larger issue of teacher quality. Chapter 1 reviews historical cycles of teacher supply and demand. The second chapter compares supply and demand for new teacher graduates in the western region and in 14 Western Interstate Commission for Higher Education (WICHE) states. Chapter 3 looks at conditions affecting teacher supply and outlines strategies for developing plans and programs for dealing with imbalances. The last chapter offers a discussion of the costs and consequences of teacher shortages with implications for the western states. An undersupply of new teacher graduates is projected in most western states over the next 15 years. The report points out the historically heavy dependence of 14 western states--Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, New Mexico, Nevada, North Dakota, Oregon, Utah, Washington, and Wyoming--on teachers trained outside their borders to meet expected needs. The question raised is can western states continue to rely on this source of new teachers as national shortages intensify, and if so, at what cost. (JD)

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Western Interstate Commission for Higher Education

Classrooms Without Teachers?

Supply and Demand in the West

by
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Western Interstate Commission for Higher Education

3

The Western Interstate Commission for Higher Education, or WICHE, is a nonprofit regional organization established by interstate compact to help western states to work together to provide high-quality, cost-effective programs to meet the education and manpower needs of the western region. Member and affiliated states are:

Alaska
Arizona
California
Colorado
Hawaii
Idaho
Montana
Nevada
New Mexico
North Dakota
Oregon
Utah
Washington
Wyoming

Through its Information Clearinghouse, which produced this report, WICHE provides information to higher education and government officials as they address important policy issues in the region.

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Foreword

The recent national concern about increasing "excellence in education" has shifted to an examination of a number of specific facets of this problem. One area receiving considerable—and appropriate—attention in 1986 was improving the quality of teachers. As noted by the Western Interstate Commission for Higher Education (WICHE) in its 1985 overview study, *Quality in Teacher Education: A Crisis Revisited,* the delivery of quality education is inextricably related to the quality of classroom teachers.

Unfortunately, little recognition has been given until now to actual and potential imbalances in the supply and demand for new teachers. This factor will play a significant role in determining the success or failure of many teacher education reforms. Severe shortages will inhibit attempts to increase the competency of teachers through credentialing, testing, degree requirements, practical and theoretical knowledge, and so forth. Conversely, oversupplies will deflate efforts to enhance the professionalism of teaching through salary increases, career ladders, merit recognition, and other factors that encourage competent teachers to stay in the field.

This report is focused on the teacher supply and demand circumstances across the 14 states served by WICHE. As with many professional fields, the West is an importer of teachers to meet the needs of a growing region—one that is changing rapidly as to ethnic composition as well as overall population.

One finding is overriding: western states are not training enough teachers within their own borders to meet demand. They must attract large numbers of practicing teachers from other states (or lure large numbers from the pool of nonpracticing teachers) in order to fill their needs. This could prove a difficult task as national teacher shortages increase and competition intensifies for the best teachers. Western educators, school administrators, and government policymakers need to plan ahead so that teacher supply can be met without sacrificing educational quality.

June 1986
Boulder, Colorado

Phillip Sirotkin
Executive Director
Western Interstate Commission
for Higher Education

Introduction and Overview

Widespread concern about the quality of instruction in our public schools has led to a variety of proposals for improving elementary and secondary schoolteaching. These proposals address the effects on teacher quality of factors such as salary comparability with industry, merit pay, a hierarchical career structure, and minimum competency requirements. Many of these proposals, however, do not adequately reflect the effects of teacher supply/demand ratios on the quality of the teaching work force. The relationship between the supply of teachers produced and the demand for additional teachers in the local schools provides the context within which quality improvements can occur.

An oversupply of teachers seeking employment allows school districts to be selective in hiring new teachers, and permits states to be relatively stringent in setting quality standards. While this does not affect directly the overall quality of the existing teaching force, it affects new teachers brought into the work force and allows the issue of quality to come to the forefront in educational policy deliberations. A shortage of qualified individuals relative to job openings may have the opposite effect, and can put a strain on quality initiatives. As the perceptive educator and critic John Goodlad has noted:

> *It is difficult to stir up much interest in improving teacher [quality] when there is an undersupply of teachers. Even the existing requirements are tossed aside in the urgent need to staff classrooms. By the time we get around to realizing that the previous shortage has been met and begin to turn our thoughts to questions of quality, the shortages begin to appear once again and we lose the opportunity an oversupply provides.*[1]

This is precisely the situation western states may face by the end of this decade unless careful planning is initiated for the education and training of an adequate supply of qualified teachers. Policymakers and school administrators may find that much of the current drive for excellence is in vain if the requisite teaching personnel are not available to accomplish needed reforms. Questions of quantity and quality are interrelated, and must be addressed together in order to achieve lasting changes.

Teacher Supply and Demand

There are many ways to look at supply/demand relationships. This study compares the current production of new teacher graduates by in-state educational institutions with the projected annual demand for additional teachers, based on population changes, teacher attrition rates, current student/teacher ratios, and other factors. In contrast, other studies compare some measure of *total* teacher supply (including those currently in the reserve pool or coming from other states or school districts) with estimated demand based on current job openings. These approaches and other methods also in use all have limitations, and cast light on different aspects of the supply/demand question.

The approach used in this study has two primary justifications. First, the data available for comparative, multistate research on teacher supply and demand are very limited. These data constraints impose a limited definition of teacher supply and result in aggregate, state-level demand projections that do not explicitly reflect district-level or subject-area teacher requirements. Second, comparing current teacher production levels with expected aggregate demand focuses attention on changes in existing policies, teaching conditions, and teacher education programs that would affect future supply/demand relationships. The methodology and focus of this report fit its underlying purpose: to urge consideration of measures to deal more effectively with trends and cycles in teacher supply and demand, and to address the supply question as a central component in efforts to improve teacher education and the quality of education more generally.

This report is intended to be part of the continuing research and policy dialogue on teacher supply and demand, and policymakers are urged to view the report in the context of other approaches. Our definitions of supply and demand do not attempt to project future conditions of teaching and teacher education. We recognize that changes are occurring and will probably continue to occur in teaching and teacher education. While the methodology does not take these changes into account in projecting supply, it suggests how these changes may influence the production of new teachers in the future.

Overview of Findings

This report examines the teacher supply/demand balance nationally and in the western region, and relates the findings to the larger issue of teacher quality. Chapter 1 reviews historical cycles of supply and demand in this country, particularly as they relate to the current and projected teaching work force situation. Chapter 2 compares the supply and demand for new teacher graduates in the western region and in 14 individual WICHE states and discusses the implica-

tions of those projections for educational policymaking in the region. Chapter 3 looks at conditions affecting teacher supply, and outlines several strategies that may be useful to states in developing plans and programs for dealing with manpower imbalances. Chapter 4 concludes with a discussion of the costs and consequences of teacher shortages and the implications of these factors for manpower planning in the western states.

Key findings, which are discussed in more detail later in the report, include the following:

- The nation is at present (mid-1986) experiencing a relative balance of supply and demand, although supply/demand conditions vary by subject area and geographic location. Spot shortages have been reported in 20-25 states nationwide.
- Most national projections indicate a moderate to severe shortage of teachers in the near future, especially at the elementary level. Nationwide, the ratio of new teacher graduates to job openings will fall from 87.3 percent in 1986 to 63.7 percent in 1992, according to projections by the National Center for Education Statistics (NCES).
- In the 1990s, the WICHE region and most individual WICHE states are likely to experience an annual undersupply of new teacher graduates from educational institutions in the region. Imbalances will intensify through the mid-1990s and then begin to decline.
- The extent of future imbalances in the WICHE region depends upon the region's ability to continue to attract large numbers of new or practicing teachers from other states. Historically, significant proportions of new teachers in the WICHE states have been in-migrants from other states. It may be difficult to maintain past levels of in-migration as national shortages intensify.
- Incentives are needed to retain existing teachers and changes must be implemented to make teaching a more attractive career alternative for highly qualified college students. Through careful planning which recognizes the cyclical nature of manpower needs, states can find ways to increase teacher supply without sacrificing quality. □

Teacher Supply and Demand Nationally

Regional and state-level projections of teacher supply and demand must be viewed in the context of national demographic and educational trends. This chapter looks at the history of teacher supply and demand in this country and reviews published manpower projections.

The 1950s and early 1960s witnessed a critical shortage of kindergarten through 12th grade (K-12) teachers as the baby boom generation flooded the public schools with an unprecedented number of pupils. The total number of teachers employed in the public schools increased 48 percent between 1950 and 1970.[2]

In response to this critical shortage of teachers, teacher education programs began to expand their production of new teacher graduates in the 1960s. By 1969, the production of new teacher graduates had almost tripled from 1960.[3] As a result, by the mid-1960s the job market for teachers had begun to level out, although there were still shortages in certain locations and subject areas.

The production of new teacher graduates declined after peaking in 1972-73, but remained at a fairly high level throughout most of the 1970s. The demand for new teachers, however, dropped significantly in the 1970s as enrollments in elementary and secondary schools declined. Because demand dropped faster than supply, the 1970s were generally characterized by an overabundance of college graduates newly qualified to teach. Table 1, which is based on projections by the National Center for Education Statistics, compares the supply of new teacher graduates with the demand for additional teachers for the years 1971-85. The table shows the extent by which supply exceeded demand throughout the 1970s. The ratio of supply to demand moved toward approximate equilibrium by the end of the 1970s.

Partly in response to the lower demand for teachers in the 1970s, enrollment in teacher education programs dropped over 50 percent between 1972 and 1980. The production of new elementary teachers declined 41 percent during that period, and the number of new secondary teachers declined 51 percent.[4] As Table 2 shows, 21 percent of all baccalaureate degrees awarded in 1970-71 were in the field of education, decreasing to less than 11 percent by 1981-82. While the

Table 1
Supply of New Teacher Graduates Compared to Demand for Additional Teachers, United States, 1971-85

Fall of Year	Supply of New Teacher Graduates	Demand for Additional Teachers	Supply as Percent of Demand
1971	314,000	163,000	192.6
1972	317,000	179,000	177.1
1973	313,000	175,000	178.9
1974	279,000	183,000	152.5
1975	238,000	186,000	128.0
1976	222,000	150,000	148.0
1977	194,000	181,000	107.2
1978	181,000	138,000	131.2
1979	163,000	129,000	126.4
1980	144,000	134,000	107.5
1981	141,000	115,000	122.6
1982	143,000	161,000	88.8
1983	146,000	164,000	89.0
1984 (projected)	146,000	143,000	102.1
1985 (projected)	146,000	158,000	92.4

Source: Valena White Plisko and Joyce D. Stern (National Center for Education Statistics), *The Condition of Education*, 1985 Edition.

total number of baccalaureate degrees conferred in all fields increased 13.5 percent between 1970-71 and 1981-82, the number of degrees awarded in education declined 42.7 percent. These changes are only due in part to declines in the proportion of prospective secondary teachers who major in education, as compared to prospective teachers who major in other disciplines.

As a result of this continuing decline in the production of new teacher graduates, the nation is at present experiencing a relative balance in the ratio of supply to demand.[5] Underlying this relative balance nationally, however, are surpluses of teachers in some locations and specialty areas and shortages in others. Some regions of the country tend to have high demand relative to supply. While the decline in youth aged 5-17 averaged 25 percent for the nation as a whole in the 1970s, there was no decline, or very limited decline, in most of the Sunbelt and western states. There are also differences

Table 2
Earned Baccalaureate Degrees Conferred in Education as a Percentage of Total Baccalaureate Degrees Conferred, United States, 1970-71 and 1981-82

Degrees Awarded	1970-71	1981-82
Total Baccalaureate Degrees	839,730	952,998
Baccalaureate Degrees in Education	176,614	101,113
Education as a Percent of Total	21.0	10.6

Source: Valena White Plisko (National Center for Education Statistics), *The Condition of Education*, 1984 edition.

in supply/demand ratios within states. Many teachers are willing to locate in suburban school districts, while nearly all inner city and rural school districts have difficulty finding teachers.

Supply/demand conditions also vary in relation to subject areas. Most studies find surpluses of teachers in some fields, such as health, the social sciences, and physical education. In contrast, there is a general shortage of mathematics, science, and special education teachers. There also are widespread shortages in data processing, foreign languages, industrial arts, and vocational education.

The shortage of mathematics and science teachers is viewed as serious, and may have an impact upon this country's economic growth and security. Between 1971 and 1980, there was a 64 percent decline in the production of new secondary science teachers, and a 78 percent decline in the number of new mathematics teachers.[6] There also has been a decline in the number of trained mathematics and science teachers who actually go into teaching (currently less than 50 percent), apparently because teacher salaries are not competitive with the salaries for mathematics and science majors in industry. A 1984 survey of placement directors found critical shortages of teachers in mathematics, chemistry, and physics.[7]

Five times as many mathematics and science teachers as teachers in other subject areas leave the local schools to take nonteaching jobs.[8] Twenty-five percent of all current mathematics and science teachers expect to leave teaching in the near future.[9] As a result of these factors, the number of qualified mathematics and science teachers is decreasing at the very time when increased emphasis is being placed on mathematics and science education in the public schools. A 1984 survey by the National Center for Education

Statistics found that large proportions of mathematics and science teachers were not certified to teach in their assigned fields—higher than in any other teaching field.[10] A number of state and federal programs have been developed to address this problem, the most common being special scholarship or loan forgiveness initiatives (see Chapter 3). In general, these efforts have not been in place long enough to evaluate their effectiveness as a supply incentive.

Current Teacher Supply and Demand Conditions

The National Center for Education Statistics (NCES) estimates that in the 1983-84 school year there was a slight shortage of teaching candidates in the country as a whole, with most of the shortages occurring in the fields of bilingual education, physics, special education, and computer science. An NCES survey found that in November 1983 there was a shortage of 1.6 new teacher candidates for every 1,000 practicing teachers nationwide; the ratio exceeded 5 per 1,000 in bilingual education and in some fields of special education.[11]

The current ratio of supply to demand in the 14 WICHE states varies considerably. In a 1985 WICHE telephone survey of the chief state school office in each WICHE state, only one state (Alaska) reported a balance of teacher supply and demand at that time. One state (New Mexico) reported a shortage of elementary and secondary teachers statewide, and the remaining 12 states reported shortages in some locations and subject areas. Five states (Alaska, Arizona, Colorado, North Dakota, and Washington) expect selective shortages to continue, and six (Hawaii, Idaho, Nevada, New Mexico, Utah, and Wyoming) expect widespread shortages within the next five years. Three states are uncertain about the longer-term outlook. In short, selective teacher shortages are already occurring and state school offices expect these conditions to continue in most western states. Using a number of different methodologies, several WICHE states have prepared more detailed analyses of current conditions of supply and demand.[12]

Most national projections indicate a moderate to severe shortage of teachers in the near future, especially at the elementary level. Both the American Association of Colleges for Teacher Education and the National Education Association predict widespread teacher shortages. Research by the Rand Corporation and National Center for Education Statistics also projects teacher shortages nationwide, with the supply of new teacher graduates estimated to meet only 85-87 percent of the demand for new teachers in 1986-87.[13]

Many who predict a teacher shortage in the near future note that the supply/demand cycle has begun to repeat itself. The baby boom

generation has now begun to have children of its own, causing an increase in the birth rate since 1977. This "baby boom echo" is enhanced by large numbers of immigrants from other countries, particularly to the Sunbelt states. The U.S. Bureau of the Census estimates that the number of children aged 5-17 will increase 12.2 percent over the next 15 years. Elementary school enrollments began increasing in 1985 and will continue to increase through the early 1990s. The demand for secondary teachers is expected to continue to decline until the early 1990s, when the echo generation will enter the nation's secondary schools.

The occurrence and extent of the projected teacher shortage depends on how quickly the drop in the supply of new teacher graduates can be reversed. If the supply of new teacher graduates continues to decline, shortages will worsen by the late 1980s. Shortages at the elementary level have already hit many states and school districts because of decreases in the supply of new teachers, high birth rates, and interstate migration. Spot shortages have been reported in 20-25 states nationwide.[14] Although 1985 witnessed surges in teacher education enrollments in some institutions, "there is no evidence of a general turnaround in the substantial decline of new graduates over the past decade."[15]

Long-term Projections

In conjunction with these demographic trends, efforts to improve pupil-teacher ratios, expand services in special education, and increase the emphasis on mathematics, science, technology, and vocational training may generate a significant increase in the demand for new teachers. Moreover, a large proportion of the current teacher work force will reach retirement age by the early 1990s. In 1981, 19.4 percent of the teacher work force was 50 years of age or older, and the National Education Association predicts that as many as 30-50 percent of all practicing teachers may retire by 1990 or 1995.[16] For these reasons, the annual demand for additional teachers is expected to increase steadily through at least 1992, as indicated in Table 3.

Taking into account a number of factors that affect student enrollment decisions, NCES projects that the supply of new teacher graduates will continue to decline slightly through 1992, as reported in Table 3. It is possible, of course, that the decline in supply will reverse in response to changing market conditions. Even if this should occur, the production of new teachers is not likely to expand as rapidly as it did in the 1960s due to continuing financial constraints on higher education and ongoing efforts to restructure teacher education and certification criteria in many states.

Table 3
Projected Supply of New Teacher Graduates Compared to Projected Demand for Additional Teachers, United States, 1986-92

Fall of Year	Projected Supply of New Teacher Graduates	Projected Demand for Additional Teachers	Supply as Percent of Demand
1986	144,000	165,000	87.3
1987	142,000	171,000	83.0
1988	39,000	162,000	85.8
1989	139,000	177,000	78.5
1990	139,000	188,000	73.9
1991	138,000	204,000	67.6
1992	137,000	215,000	63.7

Source: Valena White Plisko and Joyce D. Stern (National Center for Education Statistics), *The Condition of Education*, 1985 Edition.

If the supply of new teacher graduates continues to decline, supply will fall increasingly short of the demand for additional teachers unless the reserve pool joins the teaching force in unprecedented numbers. In the past, however, it has been difficult to attract teachers from the reserve pool, even during times of severe shortages, because many have other jobs with better pay. Moreover, the relatively large present reserve pool—the product of past oversupply—probably won't exist in 10 years, since the immediately preceding years will have been years of undersupply.

According to the NCES projections, the ratio of new teacher graduates to job openings will fall from 87.3 percent in 1986 to 63.7 percent in 1992. Some observers expect that the anticipated shortage may be the most severe the nation has experienced, particularly in inner cities and rural areas and in the fields of mathematics and science.[17]

In the prevailing circumstances, it is important that each state monitor its own situation and plan well ahead to ensure an adequate supply of qualified teachers, especially in mounting any new, changed, or expanded educational services. The next chapter projects teacher demand at the state and regional levels, and demonstrates the consequences for states of current trends in in-state teacher production and projected shortages nationwide. □

Teacher Supply and Demand in the WICHE States

Western states have a particular interest in monitoring national trends in teacher supply and demand for two reasons. First, the demographic shifts highlighted in Chapter 1 will be particularly significant in major portions of the West where the population tends to be younger, immigration will be high, and other factors will contribute to continued growth in younger age groups.

Second, most states in the West have relied in the past on a large proportion of teachers trained in other states. As the census data summarized in Table 4 shows, from 26 to 88 percent of new teachers in different WICHE states were in-migrants from other states. Much smaller proportions (3.1-8.9 percent) of the teaching work force migrated out of the WICHE states. This net in-migration of teachers made it possible for the WICHE states to meet classroom staffing requirements in the late 1970s.

This chapter examines the relationship between the supply of new teacher graduates from in-state educational institutions and demand for additional teachers in the WICHE states through the year 2000. The Appendix presents a detailed explanation of the methodology employed in these projections, including a discussion of the limitations inherent in state-level data sources and projection techniques. Despite these limitations, the projections should be useful to educators and state policymakers in comparing the annual in-state production of new teacher graduates with expected demand and in exploring options that will have long-term consequences for both the quantity and quality of teachers in the western states.

As the following discussion will show, the WICHE region and most individual WICHE states are likely to experience an annual undersupply of new teacher graduates from educational institutions in the region in the 1990s. The extent to which this will result in actual teacher workforce shortages will depend on the region's ability to continue to attract large numbers of teachers from other states. Supply/demand imbalances are likely to intensify through the mid-1990s and then begin to decline. In reviewing the projections, it is important that the reader understand some data limitations and methodological considerations which affect the projections and conclusions. These considerations are outlined first, followed by a detailed presentation of WICHE's supply/demand comparisons for 14 western states.

Table 4
In- and Out-Migration of Teachers in the WICHE States 1975-80

State	In-migrants as a Percentage of the Total Supply of New Teachers	Out-migrants as a Percentage of the Total Teaching Work Force
Alaska	88.5%	8.9%
Arizona	50.6	4.2
California	34.9	2.1
Colorado	44.7	6.0
Hawaii	54.1	5.0
Idaho	52.3	5.1
Montana	35.5	3.8
Nevada	69.0	5.0
New Mexico	42.2	5.5
North Dakota	26.7	4.8
Oregon	42.1	3.1
Utah	26.0	4.0
Washington	37.7	3.1
Wyoming	67.4	5.0

Sources: National Education Association, unpublished data; and U.S. Bureau of the Census, 1980, Public Use Microdata Sample, File A. (Analysis performed by Applied Population Laboratory, University of Wisconsin-Madison.)

Methodological Considerations

The comparisons in this chapter do not address total teacher supply and demand. Rather, they deal with the more immediate questions of the annual production by in-state educational institutions of individuals newly qualified to teach (new teacher graduates) and the annual demand for additional teachers at in-state public schools (new teacher demand).

There are two primary reasons for this methodological approach. First, the limitations in existing data sources and uncertainties inherent in more elaborate modeling techniques argue for a relatively simplified procedure. Comparing in-state teacher production with expected job openings is a manageable approach to this type of manpower analysis.

Second, the main purpose of this report is to point out where policy changes or other types of intervention may merit consideration, not to project the consequences of some assumed policy or market changes that have not occurred. This is best accomplished by comparing what is currently known about the supply of new teacher graduates with

what can be reliably projected to be the demand for new teachers based on demographic trends and current work force conditions. Holding current policies and teaching conditions constant focuses attention on factors and changes which may affect the relationship between teacher supply and demand in the future.

The following projections involve a number of additional methodological assumptions and data limitations as summarized below and explained more fully in the Appendix:

- The supply estimates (new teacher graduates) reflect the number of in-state education majors and other college graduates newly prepared to teach, based on the most recent data available across all states (for 1983). A WICHE survey of the chief state school office in each WICHE state found that since 1983, teacher education enrollments have declined in three states, remained stable in four states, and increased in six states. (One state was unable to provide an estimate.) These trends do not appear to be generalizable across states or for an extended period of time. For these reasons, the supply of new in-state teacher graduates is projected to remain constant at the 1983 level. Alternative methods of projecting teacher supply were also examined, but were found to be more problematic. For example, the NCES projections of new teacher graduates nationwide do not appear to be applicable at the state level.
- The reserve pool of qualified individuals not currently employed as teachers and in-migrating teachers from other states are additional sources available to meet new teacher demand in each state. Comparable, state-level data on the existing reserve pool are not available. In-migration data are available by state for the years 1975-80 from the 1980 U.S. census (see Table 4).
- The annual demand for additional teachers as defined in this report has three components:
  1. *New teachers needed to replace those teachers who die, retire, or leave the profession each year. An annual attrition rate of 6 percent (developed and used by the NCES) is used in these projections, although that rate may prove to be conservative in the mid-1990s in view of the aging of the teaching work force.*
  2. *New teachers needed to accommodate enrollment changes, based on state-specific birth rates and projections, school attendance projections, and estimated student migration patterns (see the Appendix). These data are used to estimate the number of new teachers who will be needed to maintain the existing ratio of teachers per 1,000 pupils in each state. Because of the*

difficulties inherent in projecting future ratios, the ratio for each state was assumed to remain constant at its 1983 level, the most recent year for which consistent data were available.

3. *New teachers needed to replace those practicing teachers who migrate to other states, based on 1975-80 migration rates (see Table 4). This out-migration factor is excluded from the regional totals in Figure 1 because of the inability to distinguish between interregional and intraregional migration.*

- Projections of the demand for additional teachers refer to demand in public schools only, except in Hawaii and North Dakota, where private schools are included in the demand projections. In many states this probably represents a conservative estimate of demand, since some proportion of both teacher demand and new teacher graduates would be attributable to private schools.

The demand estimates are assumed to be static and noncumulative. This simplification means that new teacher demand in any given year is assumed to be filled from available sources, rather than accumulating as shortages to be filled in subsequent years. Alternatively, shortages of new teacher graduates may be accommodated by increasing student/teacher ratios. In either case, the simplifying assumptions of noncumulative shortages and no increase in student/teacher ratios will tend to understate any shortage or disparity between supply and demand if this disparity persists over a period of years. In other words, if the supply of new teacher graduates does not meet demand in any given year or years and if the state or school district wishes to maintain a constant student/teacher ratio, there will be an accumulated shortage in the supply of new teachers that is not reflected in the methodology used below.

This report does not take into account changes in the conditions of teacher education, credentialling, and the work environment during the next 15 years. Rather, the report demonstrates the future implications of current supply trends. Any significant changes in the teaching profession could have a substantial impact upon the number of students choosing education as a major and/or the number of individuals qualified to teach in each state. Such changes are likely to occur as a consequence of recent reform movements in many states. Changing conditions, however, will have varying effects on teacher supply and demand. Some changes (such as teacher competency testing) may tend to diminish supply relative to demand, while other changes (such as higher salaries or increased use of teacher aides) may tend to enhance supply.

Finally, some explanation is required for the terminology that is used. The analysis employs traditional manpower terminology. As such, the

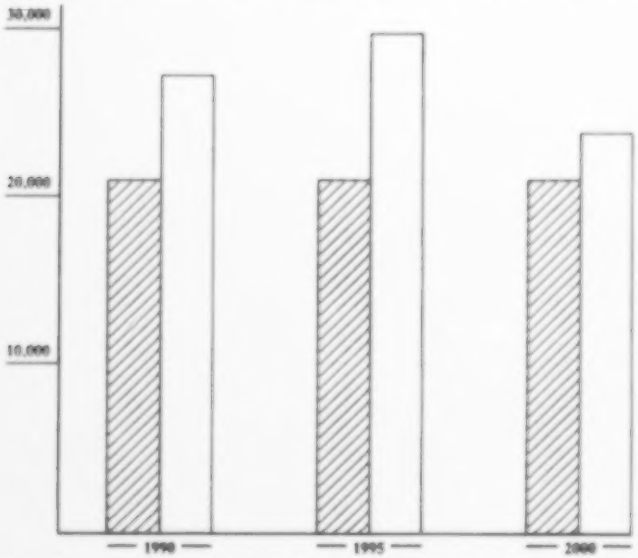
discussion refers to teacher shortages or surpluses. In this case, however, the reader should be cognizant of the fact that projected shortages or surpluses refer to new teacher graduates from in-state educational institutions, not all new teachers who may be available to fill projected job openings. The supply/demand comparisons provide an estimate of the extent to which each state's current supply of new teacher graduates from in-state institutions will need to be augmented by increased numbers of teacher education graduates, in-migrating teachers from other states, or teachers reentering the work force from the reserve pool in order to meet projected teacher demand.

Projections of Teacher Supply and Demand

Figure 1 compares the projected annual demand for additional teachers in the WICHE region in 1990, 1995, and 2000 with the production of new teacher graduates at current levels by institutions in

Figure 1

Comparison of New Teacher Demand and New Teacher Graduates from Educational Institutions in the WICHE Region, 1990-2000



Supply of new teacher graduates from educational institutions within the region. Based on 1983 data assuming no change in enrollments, qualifications, and conditions of teaching. Teachers migrating into the region are excluded as a source of new teachers.

Demand for new teachers excluding migration out of the region.

the region. Figure 1 shows that at current levels of teacher production, by 1990 the West may experience an annual undersupply of 6,000 new teacher graduates from educational institutions in the region in comparison to the demand for new teachers. This means that unless the region is able to increase teacher production or attract a net in-migration of 6,000 teachers, it may experience a serious shortage of qualified teachers. By 1995, the region will need to import an even greater number of practicing teachers as the undersupply of new regional graduates increases to over 8,000 annually. When the current generation of school children begins to leave the public schools toward the end of this century, the imbalance of supply and demand will lessen substantially. By the year 2000, the demand for new teachers will exceed the regional supply of new teacher graduates (at current levels) by only 2,000 per year.

As indicated above, the comparisons in Figure 1 exclude in-and out-migration of practicing teachers because interregional migration data are not available. In- and out-migration rates vary considerably across states (see Table 4). Regional comparisons, therefore, tend to obscure the situation in individual states. Regional supply/demand estimates also tend to balance out shortages and surpluses in specific states, thereby masking more extreme imbalances in some states.

Maps 1-3 compare each state's supply of new teacher graduates from in-state educational institutions (at current levels) with the projected demand for additional teachers in 1990, 1995, and 2000 (including demand due to out-migration of practicing teachers). The differences between supply and demand, indicated as shortages or surpluses, show what proportion of projected job openings will need to be filled by teachers from other sources (including increased production, in-migration, and the reserve pool) if classrooms are to be staffed at current levels.

Maps 1-3 show that the manpower situation in many individual WICHE states may be significantly different than the situation for the region as a whole. As Map 1 indicates, the WICHE projections show only one state (Montana) with a potential surplus of new teacher graduates from in-state educational institutions in 1990, and one (North Dakota) with a balance of supply and demand. In all other WICHE states, the number of in-state graduates newly prepared to teach is not likely to meet projected demand in 1990. These shortages may exceed 60 percent in Alaska, Nevada, New Mexico, and Wyoming.

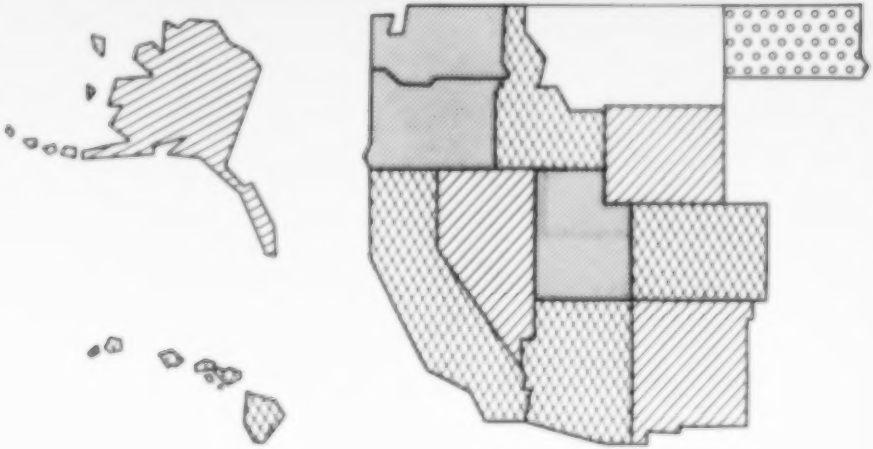
Most WICHE states experiencing a shortage of new in-state teacher graduates in 1990 will experience a more severe shortage in 1995, as shown in Map 2. By 1995, only North Dakota and Montana are likely

Map 1

Comparison of Supply of New Teacher Graduates From In-State Educational Institutions and Demand for Additional Teachers in the WICHE States, 1990

Map 1 shows that:

- The majority of WICHE states are likely to experience a shortage of new teacher graduates from in-state educational institutions by the year 1990.
- Only one WICHE state (Montana) is projected to have a surplus of new teacher graduates in 1990.
- North Dakota is projected to have a balance of supply and demand in 1990.
- Oregon, Utah, and Washington may experience a moderate shortage of new teacher graduates by 1990, and Arizona, California, Colorado, Hawaii, and Idaho may experience a serious shortage.
- The shortage of in-state graduates newly prepared to teach is expected to be critical by 1990 in Alaska, Nevada, New Mexico, and Wyoming.



Notes

1. Supply estimates are based on 1983 in-state production of college graduates newly prepared to teach.
2. In all states except Hawaii and North Dakota, demand refers to public schoolteachers only.

Legend

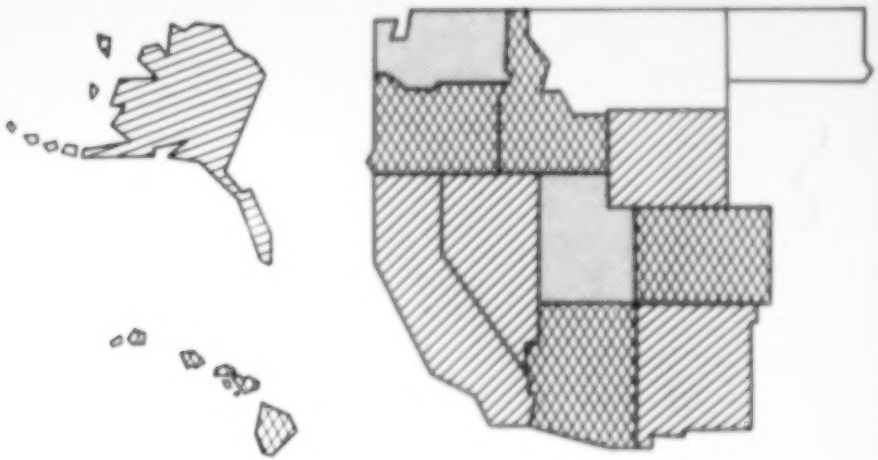
- Surplus (over 10%)
- Balance (±10%)
- Moderate shortage (11-35%)
- Serious shortage (36-60%)
- Critical shortage (over 60%)

Map 2

Comparison of Supply of New Teacher Graduates From In-State Educational Institutions and Demand for Additional Teachers in the WICHE States, 1995

Map 2 shows that:

- The relationship between supply and demand will worsen in the WICHE region by 1995.
- Most states experiencing a shortage of new teacher graduates from in-state educational institutions in 1990 will experience a more severe shortage in 1995.
- By 1995, North Dakota and Montana are projected to have a surplus of new teacher graduates. All other states are expected to have a shortage of in-state graduates newly prepared to teach.
- The shortage of new teacher graduates may continue to be critical in Alaska, Nevada, New Mexico, and Wyoming. California may also experience a critical shortage of new teacher graduates by 1995.



Notes

1. Supply estimates are based on 1983 in-state production of college graduates newly prepared to teach.
2. In all states except Hawaii and North Dakota, demand refers to public schoolteachers only.

Legend

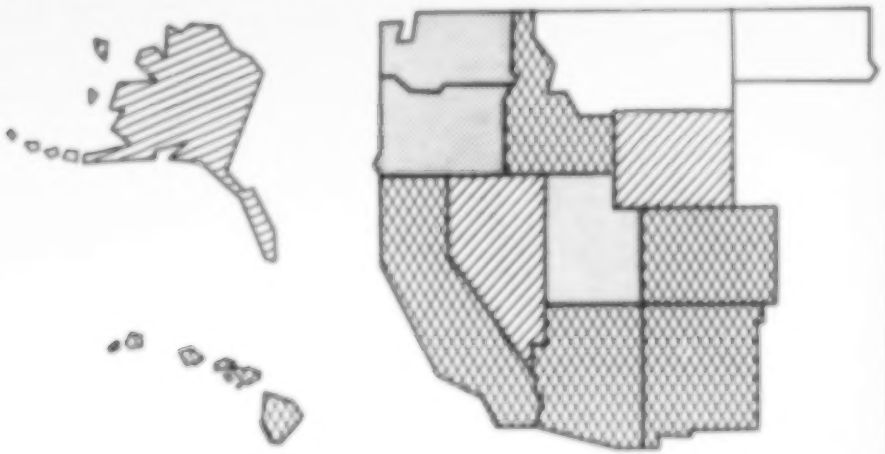
- Surplus (over 10%)
- Balance (±10%)
- Moderate shortage (11-35%)
- Serious shortage (36-60%)
- Critical shortage (over 60%)

Map 3

Comparison of Supply of New Teacher Graduates From In-State Educational Institutions and Demand for Additional Teachers in the WICHE States, 2000

Map 3 shows that:

- The relationship between supply and demand in the WICHE region will improve by the end of the century as the baby boom echo generation begins to leave the public schools.
- Montana and North Dakota will continue to experience a surplus of new teacher graduates from in-state educational institutions in 2000.
- The teaching manpower situation is projected to improve significantly between 1995 and 2000 in California, New Mexico, and Oregon.
- By the year 2000, only the states of Alaska, Nevada, and Wyoming are expected to continue to experience a critical shortage of new teacher graduates.



Notes

1. Supply estimates are based on 1983 in-state production of college graduates newly prepared to teach.
2. In all states except Hawaii and North Dakota, demand refers to public schoolteachers only.

Legend

- Surplus (over 10%)
- Balance (±10%)
- Moderate shortage (11-35%)
- Serious shortage (36-60%)
- Critical shortage (over 60%)

to have a surplus of in-state teacher graduates. Shortages of new teacher graduates may be serious (36-60 percent) in Arizona, Colorado, Idaho, and Oregon, and critical (over 60 percent) in Alaska, California, Nevada, New Mexico, and Wyoming.*

By the end of the century, the baby boom echo generation will begin to leave the public schools in most WICHE states, reflecting the cyclical nature of demographics related to teaching manpower requirements. As Map 3 illustrates, this will allow the imbalance between teacher supply and demand to lessen significantly, particularly in California, New Mexico, and Oregon. Only Alaska, Nevada, and Wyoming are expected to continue to experience a critical shortage of new teacher graduates from in-state institutions by the year 2000.

The projections show that without increases in the in-state production of new teachers, most WICHE states will need to rely on in-migrating and reentering teachers to fill an increasing proportion of job openings through the mid-1990s. In some states, this proportion will be as high as 80 percent of projected job openings. Teacher educators and policymakers will want to consider whether the imbalance can continue to be met through in-migration in view of the constraints on teacher supply nationwide.

It may become increasingly difficult to import teachers from other states as anticipated national shortages materialize. States will be competing for a decreasing number of new teacher graduates to fill an increasing number of job openings nationwide. Moreover, it may be more difficult to attract teachers from the reserve pool than in the past, since the total reserve pool diminishes in size each year and many teachers in the reserve pool may be established in more attractive jobs outside of teaching.

Other options may need to be examined, including those outlined in the following chapter, to ensure that the production of new teacher graduates in the region is sufficient to meet future demand. □

**Although California and Oregon moved into more serious levels of imbalance in 1995, the percentage change from 1990 was not large.*

Conditions Affecting Teacher Supply

Several surveys show that since 1970 there has been a dramatic decline in the number of college freshmen who indicate elementary or secondary teaching as their probable career. Table 5, based on the "American Freshman: National Norms" survey, shows that in 1970, 19.3 percent of all college freshmen intended to go into teaching after graduation. Preference for a teaching career declined to a low of 4.7 percent in 1982, and increased slightly thereafter to 6.2 percent in 1985. The problem is especially acute for women, the traditional base of the teaching profession. The percentage of female college freshmen who intended to go into elementary and secondary teaching declined from 37.5 percent in 1968 to 9.5 percent in 1985.[18]

If a serious shortage of qualified teachers is to be averted, incentives must be found to retain existing teachers and make teaching an attractive career alternative to highly qualified college students. The most frequent suggestion for enhancing the attractiveness of teaching is to increase teachers' salaries. The past decade has witnessed a substantial erosion of the material benefits of teaching. Table 6 shows that teachers' salaries have become less competitive with business or industry, and are losing ground relative to other occupations. Table 7 shows that teacher salaries have not kept up with the rate of inflation; the real earnings of public schoolteachers actually declined 12.2 percent between 1972-73 and 1982-83. The Carnegie Forum on Education and the Economy estimates that bringing teachers' salaries into line with the middle range of salaries in other occupations requiring a college degree would cost $50-100 billion per year nationally.[19]

Recent studies and trends indicate that teachers are at least as responsive to wage differentials as other workers, and this conclusion is supported by teachers' collective bargaining behavior in recent years. Other studies provide evidence that higher salaries and greater material resources attract larger numbers of comparatively bright students to teaching careers. While there have been increases in teachers' salaries nationwide (a 7.3 percent increase in 1984-85 to an average salary of $23,546), this trend would need to continue to have lasting effects.[20]

Increasing teachers' salaries across the board may have a positive effect on the supply of new teacher graduates, but it will not necessarily reduce the attrition rate of existing teachers, who are sensitive to the

Table 5
Percent of Freshmen Indicating Elementary or Secondary Teaching as their Probable Career, United States, 1970-85

Fall of Year	Percent
1970	19.3%
1971	15.4
1972	12.1
1973	8.8
1974	7.7
1975	6.5
1976	8.0
1977	6.9
1978	6.2
1979	6.4
1980	6.0
1981	5.5
1982	4.7
1983	5.1
1984	5.5
1985	6.2

Source: Valena White Plisko (National Center for Education Statistics), *The Condition of Education,* 1983 Edition. Updated with data from *The American Freshman: National Norms* for 1983, 1984 and 1985.

fact that the financial rewards of teaching do not increase commensurately with experience. One of the few ways teachers can advance professionally and financially is to move out of teaching altogether. Consequently, many proposals have involved merit pay or career ladder plans as part of a comprehensive teacher incentive structure. Briefly, the notion of merit pay means that teachers' salaries would be tied to an effective evaluation system that rewards high-quality teaching. Career ladder plans also reward experience and expertise by restructuring the teaching profession so that there is a hierarchial arrangement of teaching roles that comprise a career ladder tied to a differentiated pay scale.

Numerous other approaches have been proposed to increase the supply of qualified teachers. Rather than looking for ways to get teachers to stay in the profession, a form of "Educational Peace Corps" would recruit teachers on a short-term basis to augment the supply of teachers with people whose long-term career goals may lie outside

Table 6
Average Starting Salaries of Public Schoolteachers Compared With Starting Salaries in Private Industry, United States, 1973-74 and 1981-82

	1973-74	1981-82	Percent Change
Mean for Teachers with a Bachelor's Degree	$7,720	$12,769	65.4%
Mean for Other College Graduates with a Bachelor's Degree			
Engineering	11,220	22,368	99.3
Accounting	10,632	16,980	59.7
Sales-Marketing	9,660	17,200	78.3
Business Administration	8,796	16,200	84.2
Liberal Arts	8,808	15,444	75.3
Chemistry	10,308	19,536	89.5
Mathematics-Statistics	10,020	18,600	85.6
Economics-Finance	9,624	16,884	75.4
Other Fields	9,696	20,028	106.6

Source: C. Emily Feistritzer, *The Condition of Teaching: A State by State Analysis*, 1983 (the most recent data available).

Note: Average annual salaries not adjusted for differences in the number of workdays per year.

Table 7
Average Annual Salary of Public Schoolteachers, United States, 1972-73 and 1982-83

1972-73 Average Salary	1982-83 Average Salary in Real 1972-73 Dollars	Percentage Change in Purchasing Power
$10,164	$8,926	-12.2%

Source: C. Emily Feistritzer, *The Condition of Teaching: A State by State Analysis*, 1983 (the most recent data available).

of teaching.[21] Other groups have suggested that states make a greater effort to pull qualified teachers out of the reserve pool, perhaps through a national clearinghouse to help states locate trained teachers who are out of work. Other proposals call for better support systems for beginning teachers; greater cooperation among schools, universities, and industry to provide stipends and sabbaticals for teachers to further their professional development; and raising the standards for teacher education to make the teaching profession a more attractive career choice.

An increasing number of states are considering or implementing programs to allow college graduates without any prior teacher training to be hired for classroom teaching. The provisions for this differ. In New Jersey, college graduates without teacher training can be hired on provisional certificates with the requirement that they take 80 hours of special training and teach one year under the supervision of an experienced teacher. A plan for alternative certification in Oregon would allow college graduates without an education degree to become certified teachers if they pass teacher competency tests in basic skills and subject matter preparation. Candidates would also be expected to have college degrees relevant to the subjects they would teach.

The American Association of Colleges for Teacher Education (AACTE) has "cautiously approved admission to teaching of mid-career and reentry persons with college degrees and work experience" who are not teacher education graduates.[22] AACTE stresses, however, that teacher education programs should develop special programs to train these teacher candidates. The Southern Regional Education Board's Task Force on Higher Education and the Schools has also called for policies to allow the certification of arts and sciences graduates "with safeguards to insure the quality of instruction."[23]

Other proposals involve the awarding of undergraduate scholarships and fellowships in exchange for commitments to teach in the public schools, or extended loan programs with forgiveness provisions tied to minimum teaching commitments. These types of scholarship and loan programs are most frequently proposed as a means of attracting or retraining teachers in specific subject areas, such as mathematics and science. Two studies by The College Board, however, found no evidence that loan forgiveness contributes to an increase in the number or quality of teachers, since the loans tend to go to students who were likely to become teachers anyway. Another College Board analysis of recent loan forgiveness initiatives found that of 28 states with such programs, over one-half have been unable to recruit enough applicants to have a significant impact on teacher supply.[24] Even though there is reason to question the effectiveness of such programs, a majority of states have passed or are considering legislation authorizing loans,

scholarships, or tuition subsidies for college students who agree to teach mathematics or science in the public schools.

Several other methods for alleviating shortages in critical subject areas have also been proposed, including:

- higher salaries or one-time bonuses for teachers in critical shortage areas;
- programs encouraging graduate education or in-service training to retrain current teachers in subject areas and grade levels experiencing the greatest shortages of qualified teachers;
- joint efforts with business and industry to enable qualified applicants to enter teacher education, teach for several years (perhaps with summer jobs in industry), and then enter permanent positions in business or industry;
- reallocating teacher education resources to high demand subject areas; and
- providing short-term intensive training to persons with nontraditional backgrounds (such as industrial and retired scientists) for careers as elementary and secondary teachers.

While numerous incentive strategies have been proposed to avert a general teacher shortage, most strategies that have been implemented are limited in nature and aimed at shortages in specific subject areas. The use of more comprehensive incentive strategies, such as higher teacher salaries, merit pay, and career ladder plans, may need to expand as states face a general shortage of qualified teachers. As a necessary first step in addressing a shortage, the structure and conditions of teaching may need to be changed so that teaching becomes a more attractive career, both for new teacher candidates and existing teachers. □

Conclusion: Coping with Supply/Demand Imbalances

The discussion in Chapters 2 and 3 suggests that the western region and nation as a whole may experience a critical shortage of new teacher graduates during the next decade. These shortages reflect a diminishing supply of new teacher graduates in the face of substantial growth in the demand for additional teachers. As in the past, supply/demand imbalances in elementary and secondary schoolteaching are likely to follow a cyclical pattern related to population demographics (especially birth rates) and college enrollment patterns. Under these conditions, careful planning and timely actions to address the conditions and attractiveness of teaching can help to avoid dramatic swings in the supply/demand ratio for teachers.

The Holmes Group, a consortium of education deans from about 40 leading research universities, recently completed an analysis of teacher education in this country and a set of recommendations for improvement. As the recent report by the Holmes Group points out, how states, teacher education programs, and school districts respond to teacher supply conditions has a lasting impact on the quality of the teacher work force:

> *If we respond (to shortages) as we have in the past, unprecedented numbers of incompetent teachers will be hired; and contemporary social and economic circumstances will keep them in the nation's classrooms for many years to come. The level of performance and posture toward professional responsibility of these persons will shape the norms and effects of teaching well into the twenty-first century.*[25]

Clearly, teacher shortages have the potential to undermine many efforts to improve the quality of elementary and secondary education. One effect of teacher shortages may be an increase in pupil/teacher ratios, which have declined steadily over the past decade. Although current policies generally allow for stable or declining ratios, increases may be unavoidable if sufficient teaching staff are not available to accommodate increasing enrollments. Alternately, if incentives are not used to enhance the supply of qualified teachers, states and school districts may be forced to maintain pupil/teacher ratios by hiring underqualified persons to fill vacant teaching positions.

Already some school districts facing shortages of qualified teachers are altering their standards in order to fill unexpected vacancies, and many states have considered reducing standards for teacher hiring.[26] This creates a situation where "school districts around the nation are lowering standards for hiring new teachers at a time when polls show that the public wants standards for teacher education raised," according to National Education Association president Mary Futrell.[27]

The use of emergency certificates and out-of-field assignments apparently has increased substantially in the past two years. According to the National Center for Education Statistics, 12.4 percent of all newly hired teachers in public and private schools in 1983 were uncertified to teach in their principal field of assignment. In 1985-86, almost 70 percent of the new teachers hired in the Los Angeles school district had emergency credentials, and 50 percent of the new teachers hired in New York City did not meet the educational requirements for state certification.[28] The problem of out-of-field teaching is particularly critical in the fields of mathematics and science. Over one-quarter of all teaching positions in mathematics, for example, are filled by teachers who are not fully certified to teach mathematics, and this number appears to be growing.[29]

A large proportion of these underqualified teachers are being placed in schools with predominantly disadvantaged and minority student populations.[30] Further aggravating the situation, the proportion of low income and minority youth in the population is increasing, while the rate of minority entry into the teaching profession has been declining.[31] This raises serious questions about the continuing ability of the teaching force to meet the special needs of at-risk student populations.

Many states may need to consider mechanisms to enhance the number of qualified teachers in particular locations and fields, as well as to address the question of overall teacher supply. Most importantly, states need ways to increase teacher supply without sacrificing quality. Otherwise, our system of education may face a major crisis that threatens to erode states' commitment to strengthen quality of teaching in the public schools.

Conclusion: A Shortage at What Price?

Accounts of past imbalances in teacher supply/demand and projections of future shortages are a reminder that any action (or inaction) to reverse the widening manpower imbalance will have associated costs. These costs can be minimized, and the positive effects of reform efforts maximized, through careful planning which recognizes the cyclical nature of manpower needs. As the Holmes Group notes, changes must be made "to enable American schools to absorb enrollment swings without the mindless responses—first hiring thousands

of unqualified warm bodies, and then riffing* thousands of capable teachers—that have marked the last three decades of educational history."[32]

The problem may be especially acute in the West, which has traditionally imported large numbers of teachers from other states, thereby maintaining supply/demand balances in spite of undersupplies of new teacher graduates from educational institutions in the region. As past surpluses dwindle and national shortages materialize, policymakers will need to consider whether in-migration can continue to be a major source of new teachers in the western states.

Rapidly changing demographics in the West (particularly in the Southwest) will place new demands on school teachers to accommodate growing numbers of minority youth in the population. The increasing proportion of minority children will be accompanied by changes in family structure, language requirements, and educational needs and strengths, all of which will reflect upon the size, composition and qualifications of the elementary and secondary teaching force.

In short, within the next few years the western states will experience a rapidly growing and diversifying youth population, with a concomitant increase in the demand for highly qualified new teacher graduates. The West will, in all likelihood, continue to attract new teachers from other states—the question is at what level and cost? These factors make it imperative that policymakers in the WICHE states employ foresighted measures to ensure adequate supplies of qualified new teachers who can meet the needs of students in the western states. □

*Riffing refers to "reductions in force."

Footnotes

[1]John I. Goodlad, "Let's Get on With the Reconstruction," *Phi Delta Kappan*, September 1982:19-20.

[2]Bob Palaich, *State Policies to Screen and Attract Teachers* (Denver, CO: Education Commission of the States, 1983); Peter Williams, *Planning Teacher Demand and Supply* (Paris: UNESCO, 1979).

[3]Keith H. Asplin, "A Review of Teacher Education Programs in Colorado" (Denver, CO: Colorado Commission on Higher Education, 1979).

[4]James N. Akin, *Teacher Supply/Demand 1981* (Madison, WI: Association for School, College and University Staffing, 1982).

[5]Edward DeRoche and Edward Kujaiwa, "A Survey of Teacher Supply and Demand in the West," *Phi Delta Kappan*, April 1982:566; Gary Sykes, "Public Policy and the Problem of Teacher Quality: The Need for Screens *and* Magnets." In Lee Shulman (ed.), *Handbook of Teaching and Policy* (New York: Longman, Inc., 1983); James Akin, *Teacher Supply/Demand 1983* (Madison, WI: Association for School, College and University Staffing, 1983); Valena White Plisko and Joyce D. Stern, *The Condition of Education*, 1985 Edition (Washington, DC: National Center for Education Statistics, 1985); Cindy Currence, "Shortages of '85 Vanish as Schools Hire Uncertified Teachers," *Education Week*, September 25, 1985.

[6]Task Force on Education for Economic Growth, *Action for Excellence: A Comprehensive Plan to Improve Our Nation's Schools* (Denver, CO: Education Commission of the States, June 1983).

[7]James N. Akin, *Teacher Supply and Demand: A Recent Survey* (Manhattan, KS: Association for School, College and University Staffing, 1984).

[8]Anne Flowers, "Addressing Teacher Shortages." Testimony given to the House Subcommittee on Elementary, Secondary and Vocational Education and House Subcommittee on Postsecondary Education, 1982.

[9]Western Interstate Commission for Higher Education, *High-Technology Manpower in the West: Strategies for Action* (Boulder, CO: 1983).

[10]National Science Board, *Science Indicators: The 1985 Report* (Washington, DC: 1985).

[11]U.S. Department of Education, *Indicators of Education Status and Trends* (Washington, DC: January 1985); "Nation's Schools Fell 4,000 Teachers Short in 1983-84," *Edstats* Vol 1(1), August 1985.

[12]For other approaches to current supply and demand in WICHE states, see Barry L. Bull, *A Study of Initial Teacher Preparation in Washington* (Olympia, WA: Council for Postsecondary Education, 1985); Victoria L. Bernhardt and David P. Wright, *A Report on Teacher Supply: Enrollments in Professional Preparation Programs in California Institutions 1982-84* (Sacramento, CA: Commission on

Teacher Credentialing, 1985); Roger E. Neppl and Jerry Scezney, *Teacher Supply and demand for K-12 Public School Programs in Colorado: 1985 and Beyond* (Denver, CO: Colorado Department of Education, 1986); Holly Zanville, *Profile of 1983-84 Graduates of Oregon Schools and Colleges of Education One Year After Graduation* (Office of Academic Affairs, Oregon State System of Higher Education, August 1986).

[13]*Higher Education Daily* Vol 11(38), February 25, 1983; National Education Association, *Teacher Supply and Demand in Public Schools, 1979* (Washington, DC: 1980); Linda Darling-Hammond, *Beyond the Commission Reports* (Santa Monica, CA: Rand Corporation, 1984); Valena W. Plisko, *The Condition of Education*, 1983 and 1984 editions (Washington, DC: National Center for Education Statistics, 1983 and 1984); Plisko and Stern, 1985.

[14]Blake Rodman, "Hiring of Untrained in Shortage 'Crisis' Makes Sham of Reform, Futrell Warns," *Education Week*, September 4, 1985; "Some Schools Face Teacher Shortages," *USA Today* research.

[15]Southern Regional Education Board, *Improving Teacher Education: An Agenda for Higher Education and the Schools* (Atlanta, GA, 1985): 3; Joan Connell, "WWU Education Dean Pushes for Excellence," Bellingham, WA *Herald*, April 10, 1985.

[16]Suzanne Gardener, *Status of the American Public School Teacher, 1980-81* (Washington, DC: National Education Association, 1982); Currence, 1985.

[17]Currence, 1985; Gary Sykes, *Teacher Preparation and the Teacher Workforce: Problems and Prospects for the Eighties* (Washington, DC: National Institute of Education, 1981); Flowers, 1982; Clyde A. Paul, "Bald Eagles, Sperm Whales, and Mathematics Teachers," *Mathematics Teacher*, September 1979:424-27.

[18]Betty M. Vetter, Eleanor L. Babco and Susan Jensen-Fisher, *Professional Women and Minorities, A Manpower Data Resource Service*, Third Edition (Washington, DC: Scientific Manpower Commission, 1982); Alexander W. Astin, Margo King Hemond, and Gerald T. Richardson, *The American Freshman: National Norms for Fall 1982* (Los Angeles, CA: University of California at Los Angeles, 1982); Alexander W. Astin, Kenneth C. Green, William S. Korn, and Merilynn Schalit, *The American Freshman: National Norms for Fall 1985* (Los Angeles, CA: University of California at Los Angeles, 1985).

[19]Robert L. Jacobson, "Higher Pay for 'Crackerjacks' Among Reforms Proposed for Schoolteaching," *The Chronicle of Higher Education*, September 4, 1985.

[20]William H. Baugh and Joe A. Stone, *Mobility and Wage Equilibration in the Educator Labor Market* (Eugene, OR: Oregon University Center for Educational Policy and Management, 1980); Harvey J. Tucker and David B. Hill, "Teacher Quality and Expenditures for Public Education," *State Government*, Vol 58(3), Fall 1985; Anne Mackay-Smith, "Student Boom Makes Teachers a Prized Catch," *The Wall Street Journal*, June 20, 1985; "Average Elementary and Secondary School Teacher Salaries, 1984-85," *Higher Education Daily*, September 12, 1985.

[21]Robert K. Wimpelberg and Jean A. King, "Rethinking Teacher Recruitment," *Journal of Teacher Education*, January-February 1983:5-8.

[22]"Teacher Colleges Approve Alternative Certification with Cautions," *Education Times*, February 27, 1984:3.

[23]"Certifying Arts and Sciences Graduates to Teach" (Atlanta, GA: Southern Regional Education Board, April 1984):1.

[24]"Teacher Incentive Loan Programs Meet with Mixed Success," *Higher Education Daily*, August 1, 1985; Robert W. Hartman, *Credit for College: Public Policy for Student Loans* (New York: McGraw-Hill Book Co., 1971); College Entrance Examination Board, *Notes and Working Papers Concerning the Administration of Programs Authorized Under Student Financial Assistance Statutes.* Prepared for the Subcommittee on Education of the Senate Committee on Labor and Public Welfare, 90th Congress, 2nd Session, 1968; Lois D. Rice (ed.), *Student Loans: Problems and Policy Alternatives* (New York: College Entrance Examination Board, 1977); Irene K. Spero, *The Use of Student Financial Aid to Attract Prospective Teachers: A Survey of State Efforts* (Washington, DC: College Entrance Examination Board, 1986).

[25]"Tomorrow's Teachers: A Report of the Holmes Group." Reported in *The Chronicle of Higher Education*, April 9, 1986:32.

[26]Mackay-Smith, 1985; Rodman, 1985; "Futrell Lashes Out at Boards for Hiring of Untrained Teachers," *Teacher Education Reports*, September 12, 1985.

[27]"State Certification Plans Bypass Teacher Colleges," *Higher Education Advocate*, Vol 3(1), October 8, 1985:2.

[28]Ezra Bowen, "And Now, a Teacher Shortage," *Time*, July 22, 1985; Currence, 1985; Bill Bishop, "Oregon Says Few Teachers Misassigned," Eugene, OR *The Register-Guard*, September 28, 1985; Plisko and Stern, 1985; "Futrell Lashes Out at Boards for Hiring of Untrained Teachers," *Teacher Education Reports*, September 12, 1985; Rodman, 1985.

[29]Task Force on Education for Economic Growth, 1983; Plisko, 1983; Currence, 1985.

[30]Bowen, 1985; Currence, 1985; "Futrell Lashes Out at Boards for Hiring of Untrained Teachers," *Teacher Education Reports*, September 12, 1985; Rodman, 1985.

[31]Holmes Group, 1986.

[32]Holmes Group, 1986:28.

Appendix: Methodology

The following methodology was employed in calculating projected teacher supply and demand:

DEMAND

Formulas

1. $\text{Demand}_X = DR_X + DG_X + DO_X$
2. $DR_X = \text{Replacement Rate} \times \#\text{Teachers}_{x-1}$ where

$$\#\text{Teachers}_X = \frac{\text{Enrollment}_X}{1{,}000} \times \frac{\text{Teachers}}{1{,}000 \text{ Pupils}}$$

3. $DG_X = \#\text{Teachers}_X - \#\text{Teachers}_{x-1}$
4. $DO_X = \#\text{Teachers}_{x-1} \times$ Out-migration rate,

$$\text{where Out-migration Rate} = \frac{\text{Out-Migrants}_{1975\text{-}80}}{\#\text{Teachers}_{1974\text{-}79}}$$

Definitions

Demand_X = Annual demand for additional teachers (or job openings)

DR_X = Demand due to replacement

DG_X = Demand due to growth (enrollment growth only; the ratio of teachers per 1,000 pupils was held constant)

DO_X = Demand due to out-migration of practicing teachers

$_X$ = Subscript denoting projection year

Data Sources

- The replacement rate (6 percent) was provided by the National Center for Education Statistics (NCES).
- Enrollment data are based on WICHE's *High School Graduates: Projections for the Fifty States* (1984), which provides state-level historical information on birth rates, K-12 enrollments by grade, and grade-to-grade progression rates. Birth rates were extrapolated using linear regression of 25 years of historical data. These rates were then applied to the enrollment and progression rates in the high school graduates report to derive projected enrollments in elementary and secondary schools in each state. Because of the techniques used in projecting birth rates, enrollment projections

for the end of the century are more tenuous than projections for earlier years (which are based on actual birth rates).

- Historical data on the number of practicing teachers were provided by the National Education Association (NEA).
- The ratio of teachers per 1,000 pupils was calculated using K-12 enrollment figures from WICHE's high school graduates report and NEA estimates of the number of practicing teachers; ratios were held constant at 1983 levels.
- Out-migration data were taken from the 1980 U.S. census; analysis was performed by the Applied Population Laboratory, University of Wisconsin-Madison.

SUPPLY

Formulas

1. $\text{Supply}_X = \text{SE}_X \times \text{Enhancement Rate}$
2. $\text{Enhancement Rate} = \dfrac{\text{NTG}_X}{\text{SE}_X}$

Definitions

Supply_X = Annual supply of new teacher graduates; held constant at 1983 level

SE_X = Supply of education graduates; most recent data are for 1983

Enhancement Rate = Rate by which education degrees undercount total graduates newly prepared to teach

NTG = Total number of new teacher graduates (all college graduates newly prepared to teach); most recent data are for 1981

$_X$ = Subscript denoting projection year

Data Sources

The most recent state-level data on graduates with degrees in education are for 1983 (from the National Center for Education Statistics). These data, however, undercount the total number of new graduates prepared to teach because some college graduates with other majors also complete the educational requirements for teacher certification. In fact, most prospective secondary teachers do not major in education. Data on the total number of graduates newly prepared to teach (from the National Education Association) are most recently available by state for 1981. The rate by which education degrees undercount the total number of graduates newly prepared to teach was computed using 1981 data; this rate was applied to the 1983 data on the supply of education graduates. Comparable education graduate data were also examined for the previous two years. A three-year average of graduates was considered, but did not appear to provide a more reliable projection base.

The estimates of supply and demand derived from this methodology indicate the future implications of current trends. In interpreting the projections, however, the reader should be cognizant of several data limitations which may cause actual manpower situations to differ somewhat from projected trends. Data limitations not already discussed in Chapters 1 and 2 include the following:

- Not all new teacher graduates apply for teaching jobs;
- Some new teacher graduates fail to meet minimum certification requirements; others are minimally qualified and are unable to obtain teaching jobs;
- According to the National Education Association, approximately 10.8 percent of new teacher graduates leave the state in which they were trained to enter the work force in another state;
- Even during periods of full employment, 100 percent of new graduates will not obtain teaching jobs. Reasons include mismatches between job candidates and available jobs with respect to subject area, geographical location, qualifications, etc.;
- The replacement rate utilized in this study (6 percent) may be conservative. The U.S. Department of Labor estimates a replacement rate of 10.6 percent for elementary teachers and 9.3 percent for secondary teachers;
- As teacher education policies and credentialling requirements change, the ratio of education degrees to total new teacher graduates may change. For example, some states are considering or implementing changes requiring prospective teachers to major in a discipline rather than in education. This may necessitate a change in the way new teacher graduates are counted in some states; and
- Levels of out-migration of practicing teachers may change as national shortages materialize.□

Bibliographic Note

This report is based on an in-depth review of the literature on teacher quality and supply and demand. A number of sources are identified in the footnotes to the report. Many others are listed in an extensive bibliography included in the WICHE report entitled *Quality in Teacher Education: A Crisis Revisited* (1985). Copies of that report (WICHE Publication number 2A136, $10) can be obtained from the WICHE Publications Secretary, P.O. Drawer P, Boulder, Colorado 80301-9752. □